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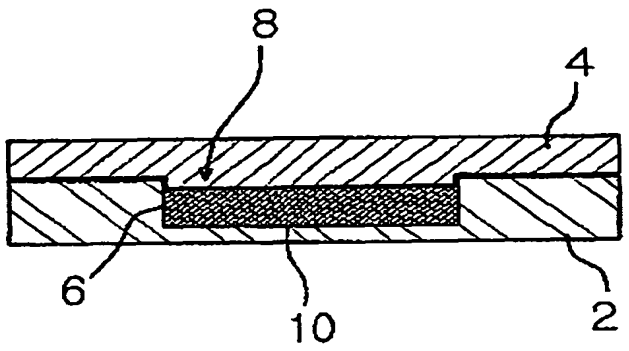
(54) Title: AUXILIARY TOOL FOR EXAMINATION OF BIOPSY SPECIMEN



(57) Abstract: Disclosed is an auxiliary tool for examination of a biopsy specimen. The auxiliary tool comprises a plate and a cover, each of which is in a gel form to allow for flowing in and out of a solvent, wherein the plate is equipped with at least one depression provided on a surface thereof as a space into which a biopsy specimen is introduced, and the cover is equipped with at least one projection provided on a surface thereof for covering the depression of the plate by being inserted thereinto.

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AUXILIARY TOOL FOR EXAMINATION OF BIOPSY SPECIMEN

Technical Field

The present invention relates, in general, to an auxiliary tool for histological or cytological examination of a biopsy specimen. More particularly, the present invention relates to an auxiliary tool for examination of a biopsy specimen, comprising a plate and a cover, each of which is in a gel form to allow for flowing in and out of a solvent, wherein the plate is equipped with at least one depression provided as a space on a surface thereof into which a biopsy specimen is introduced, and the cover is equipped with at least one projection provided on a surface thereof for covering the depression of the plate by being inserted thereinto.

Background Art

Typically, cytologic specimens collected from humans or animals were directly smeared onto slides, fixed thereon with alcohol, stained, and subjected to microscopic evaluation. However, there are significant disadvantages with the conventional method. For example, the conventional method allows only basic tests such as Papanicolaou staining, with which other several tests required for diagnosis of a specific disease or infection are difficult to be carried out.

On the other hand, the above problems can be overcome by evaluating a specimen to be examined using a histological method. With this method, a specimen is prepared, subjected to a desired test such as staining, and then microscopically observed. In other words, first a specimen to be tested is solidified in a cassette and then the solidified specimen is taken out from the cassette, positioned at a lower portion of a base mold and embedded in paraffin. The resulting embedding block is cut into a thin section. The thin sections are then placed onto slides and microscopically evaluated. In this method, the solidification of the specimen in the storage cassette is accomplished

by directly filling the cassette with a coagulant such as paraffin, or by enclosing the material with filter paper, plasma, etc. and then solidifying the above material by inserting a coagulant such as proteins or polysaccharides into the cassette.

Unlike the direct smearing method the above embedding block-preparing method allows a specimen to be subjected to all of several tests required for a medical diagnosis since it provides several thin sections from an embedding block of a single specimen, each of which is placed onto a slide. However, the embedding block-providing method is disadvantageous in terms that a microscopic thin section on a slide has a potential of being mixed with other sections on other slides or contaminated with unnecessary reagents because of being exposed on the slides, and thus, that test results may be unreliable.

Histological or cytological preparations method is disclosed in Japanese Pat. Publication No. 2002-303568, which comprises introducing a specimen into a storage cassette, solidifying the specimen with a fixing support containing glucomannan and formalin, gelating the solidified specimen with acetone, polyethylene glycol or glycerine, and the like, placing the gelated specimen at a lower portion of the storage cassette and embedding the gelated specimen in paraffin, sectioning a resulting block using a cutting tool to provide histological or cytological preparations. However, this method may cause a specimen to be contaminated with the solidifying substances because of directly introducing the specimen into the storage cassette and solidifying the specimen therein. Also, since the storage cassette is porous, with this method, it is impossible to prepare histological or cytological preparations by directly introducing very small amounts of the solidifying substances or viscous samples into the storage cassette.

On the other hand, U.S. Pat. No. 5,137,710 discloses a method of preparing a cell block, comprising placing a paper filter having a circular aperture in a middle region thereof into a carrier that provides a recess, depositing a sample to be examined and a gel medium, such as an algin medium, in the aperture of the paper filter, and solidifying the sample. However, this method has a disadvantage that a sample should be deposited in the aperture of the paper filter before the gel medium is hardened in order to entrap the sample material.

Disclosure of the Invention

Conducted by the present inventors, the thorough and intensive research to solve the problems encountered in the prior art resulted in the development of an auxiliary tool for examination of a biopsy specimen, comprising a plate and a cover, which is capable of preventing a specimen from being contaminated and lost. The present invention also enables to process a very small amount of a solid or viscous specimen into a histological or cytological preparation simply and accurately.

It is an object of the present invention to provide an auxiliary tool for examination of a biopsy specimen comprising a plate and a cover, each of which is in a gel form to allow for flowing in and out of a solvent, wherein the plate is equipped with at least one depression provided on a surface thereof as a space into which a biopsy specimen is introduced, and the cover is equipped with at least one projection provided on a surface thereof for covering the depression of the plate by being inserted thereinto.

It is another object of the present invention to provide an embedding block including the auxiliary tool for examination of a biopsy specimen of the present invention.

It is a further object of the present invention to provide a method of preparing a histological or cytological preparation for a biopsy specimen using the auxiliary tool for examination of a biopsy specimen of the present invention.

Brief Description of the Drawings

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of an auxiliary tool for examination of a biopsy specimen including a plate and a cover according to a first embodiment of the present invention;

FIG. 2 is a perspective view of an auxiliary tool for examination of a biopsy specimen including a plate and a cover according to a second embodiment of the present invention;

FIG. 3 is a sectional view showing a state at which the cover of the auxiliary tool of FIG. 1 is inserted into the plate thereof;

FIG. 4 is a schematic view showing a process of preparing an embedding block using the auxiliary tool of the present invention, into which a biopsy specimen has been introduced; and

FIG. 5 is a top plane view of a thin section of the embedding block of FIG. 4, which is placed on a slide for microscopic examination of the biopsy specimen.

Best Mode for Carrying Out the Invention

The present invention is directed to provide an auxiliary tool for examination of a biopsy specimen (hereinafter, simply referred to as "auxiliary tool").

The auxiliary tool of the present invention comprises a plate and a cover, each of which is in a gel form to allow for flowing in and out of a solvent, wherein the plate is equipped with at least one depression provided on a surface thereof as a space into which a biopsy specimen is introduced, and the cover is equipped with at least one projection provided on a surface thereof for covering the depression of the plate by being inserted thereinto.

The term "biopsy specimen", as used herein, refers to a specimen that is isolated from an anatomical area of individuals such as plants and animals, including humans, and applicable for histological or cytological examination.

Non-limiting examples of the biopsy specimen capable of being examined using the auxiliary tool of the present invention include typical cells or tissues, sputum, bile or viscous samples caused by bronchial washing, bronchial brushing or lung aspiration, and effusion fluids such as high protein content pleural fluids, peritoneal fluids or pericardial fluids. In particular, the auxiliary tool of the present invention may examine bone marrow that is impossible to be analyzed by conventional cytological methods.

The auxiliary tool of the present invention is composed of the plate and the cover. Due to their properties of being present in a gel form, the plate and the cover both allow for flowing in and out of a solvent by the osmosis principle, are able to prevent a biopsy specimen to be examined from being contaminated with other specimens or impurities by preventing their penetration thereinto, and are able to prevent loss of the biopsy specimen to be examined.

To be prepared in a gel form, each of the plate and the cover as the major components of the present auxiliary tool is made of a substance forming a gel at about 20°C to 40°C and not melted at 70°C to 90°C. Preferred are agarose, agar or gelatin, but the substance is not limited to the examples. The substance may be present in a solid phase or a liquid phase. In case of being in a solid phase, the substance may be in the form of powder or gel. Each of the agarose, the agar and the gelatin is a transparent substance that is gelated at about 35°C, melted at higher than about 90°C and has flexibility in a solid phase.

Each of the plate and the cover as the major components of the present auxiliary tool may be prepared by preparing a mold having a proper size and a proper shape, pouring a substance capable of being gelated, such as agarose, agar or gelatin, into the mold, and cooling the mold.

In addition, to prevent the plate and the cover prepared from being dried or decomposed, they are preferably stored in an organic solvent, such as alcohol, until use for examination of a biopsy specimen.

On the other hand, the plate as a major component of the auxiliary tool of the present invention may include at least one depression provided on a surface thereof, into which a biopsy specimen is introduced. The depression may be controlled in size, depth, shape, and the like, according to the size and amount of a biopsy specimen to be examined. Also, the number of the depressions may be determined according to the kind of biopsy specimens to be examined, staining methods, and other distinctive test methods, and may be formed one or more.

In addition, the cover as a major component of the auxiliary tool of the present invention may include at least one projection provided on a surface thereof, which is inserted into the depression of the plate. The size, height, shape and number of the projections may vary according

to the size, depth, shape and number of the depressions, so that the projections are capable of preventing contamination and loss of a biopsy specimen to be examined.

In an aspect, the auxiliary tool of the present invention may be processed to prepare a histological or cytological preparation capable of preventing contamination and loss of a biopsy specimen through a process including introducing the biopsy specimen into the depression provided on the surface of the plate, placing onto the plate containing the biopsy specimen the cover having the projection which covers the depression by being inserted thereinto. Thus, the auxiliary tool facilitates examination of the biopsy specimen.

In addition, the auxiliary tool of the present invention may be processed to prepare an embedding block after being pretreated, for example, sequentially with alcohol, xylene and a wax. The embedding block containing a biopsy specimen may be sectioned into a proper thickness using a tissue microtome to provide a histological or cytological preparation that will be evaluated by a typical test method.

The auxiliary tool of the present invention will be described in more detail with reference to the accompanying drawings, as follows.

FIG. 1 is a perspective view of an auxiliary tool including a plate and a cover according to a first embodiment of the present invention. FIG. 2 is a perspective view of an auxiliary tool including a plate and a cover according to a second embodiment of the present invention. FIG. 3 is a sectional view showing a state at which the cover of the auxiliary tool of FIG. 1 is inserted into the plate thereof. FIG. 4 is a schematic view showing a process of preparing an embedding block using the auxiliary tool of the present invention, into which a biopsy specimen has been introduced. FIG. 5 is a top plane view of a thin section of the embedding block of FIG. 4, which is placed on a slide for microscopic examination of the biopsy specimen.

As shown in FIGS. 1 and 2, the auxiliary tool of the present invention is composed of a plate 2 and a cover 4. The plate 2 and the cover 4 may be prepared by preparing molds in forms capable of providing the plate 2 and the cover 4 as shown in FIGS. 1 and 2, pouring a substance capable of being gelated into each of the molds, and cooling the molds. Preferably, the plate 2 and

the cover 4 may be prepared by using a 1% to 5% agarose or agar solution or a 1% to 5% gelatin solution. Most preferred is a 1% to 5% agarose solution. To prevent the plate 2 and the cover 4 from being dried or decomposed, they may be stored in an organic solvent such as alcohol, and preferably, about 10% to 100% alcohol, until they are used for examination of a biopsy specimen.

On the other hand, the plate 2 is characterized by including a depression 6 provided on a surface thereof to contain a biopsy specimen 10 and prevent contamination and loss of the biopsy specimen 10. The size of the plate 2 may vary depending on the size of a cassette used in a conventional test method. Preferably, the plate 2 has a width to length ratio ranging from 1:1 to 1:3. The thickness of the plate 2 may vary depending on the amount and size of the biopsy specimen 10 introduced thereinto. In addition, the depression 6 provided on the surface of the plate 2 may vary in size and thickness according to the amount and size of the biopsy specimen 10. Preferably, the depression 6 has a width to length ratio ranging from 1:1 to 1:3. The depth of the depression 6 may vary depending on the amount and size of the biopsy specimen 10 introduced thereinto.

In another aspect, the depression 6, as shown in FIG. 2, may be formed on the surface of the plate 2 in a number of one or more according to the kind of a biopsy specimen to be tested, staining methods, and other distinctive test methods. It is preferred that the plate has 1 to 10 depressions.

In a further aspect, the depression 6 of the plate 2 preferably has a quadrangular shape. However, those skilled in the art will easily appreciate that the shape of the depression 6 may be modified, for example, depending on the size and amount of a biopsy specimen to be examined.

On the other hand, the cover 4 is characterized by being equipped with a projection 8 provided on a surface thereof and capable of covering the plate 2 by being inserted into the depression 6 of the plate 2 containing the biopsy specimen 10. Preferably, the cover 4 has a size identical to the plate 2 and a thickness thinner than the plate 2. In addition, the size, height, shape and number of the projections 8 provided on the surface of the cover 4 may be controlled according to the size, depth, shape and number of the depressions 6 provided on the surface of the plate 2, so long as the biopsy specimen 10 introduced into the plate 2 is not contaminated or lost.

On the other hand, as shown in FIG. 3, the auxiliary tool of the present invention may be

processed to prepare a histological or cytological preparation capable of preventing contamination and loss of the biopsy specimen 10 by a process including introducing the biopsy specimen 10 into the depression 6 provided on the surface of the plate 2, placing onto the plate 2 containing the biopsy specimen 10 the cover 4 having the projection 8 which covers the depression 6 by being inserted thereinto. Thus, the auxiliary tool facilitates examination of the biopsy specimen.

In a further aspect, the auxiliary tool of the present invention, after a biopsy specimen is introduced thereinto, may be embedded in a wax, such as paraffin or bee wax, to provide an embedding block. The embedding block may be sectioned to give a histological or cytological preparation that will be examined by a conventional test method.

Before being processed to prepare the embedding block, the auxiliary tool containing the biopsy specimen 10 may be subjected to a pretreatment process including dehydration with alcohol, clearing by immersion in xylene and penetration with a wax, such as paraffin or bee wax.

As shown in FIG. 4, after being pretreated as described above, the auxiliary tool containing the biopsy specimen 10 is placed in a base mold 14, and a small amount of a wax 16 is poured onto an upper portion of the auxiliary tool. Then, the auxiliary tool is cooled to provide a solid embedding block 18. Hereinafter the wax 16 is poured onto the auxiliary tool, the auxiliary tool is preferably covered with a cassette 12. This is because a tissue microtome 22 typically used upon sectioning of the embedding block 18 has a holder fitting to the cassette, and thus facilitates the attachment and detachment of the embedding block 18 to and from the tissue microtome 22. Therefore, the embedding block 18 may be fixed onto the tissue microtome 22 via the cassette 12, and sectioned into a thin thickness to provide a section 20 containing the biopsy specimen 10 as a histological or cytological preparation.

Finally, as shown in FIG. 5, the thin section 20 may be attached onto a transparent glass slide 24, subjected to a desired test, and then microscopically observed.

A better understanding of the present invention may be obtained through the following examples which are set forth to illustrate, but are not to be construed as the limit of the present invention.

EXAMPLE 1: Preparation of an auxiliary tool comprising a plate and a cover according to the present invention

4 g of agarose was added to a beaker containing 100 ml distilled water and melted by heat treatment.

The resulting agarose solution was poured into each of a plate mold and a cover mold, and then slowly cooled to room temperature for gelation. The resulting gelated plate was 10 mm wide, 10 mm long and 4 mm thick, and included a depression which was 5 mm wide, 5 mm long and 3 mm deep on a surface thereof. The gelated cover was 10 mm wide, 10mm long and 1.5 mm thick, and included a projection which was 4 mm wide, 4mm long and 1 mm high on a surface thereof.

EXAMPLE 2: Preparation of an embedding block containing a biopsy specimen using the auxiliary tool of the present invention and sectioning thereof

A biopsy specimen was introduced into the depression of the plate prepared in Example 1, and the cover prepared in Example 1 was then inserted onto an upper portion of the plate.

The auxiliary tool including the plate and the cover inserted on the plate was dehydrated by being immersed in 70% alcohol, 80% alcohol, 90% alcohol and then 100% alcohol, for 1 hr to 2 hrs in each case. The dehydrated agarose gel was cleared by immersion in xylene for 2 to 4 hrs, and then penetrated with paraffin for 2 to 4 hrs.

The auxiliary tool prepared as described above was placed into a base mold in a direction at which a surface to be cut thereof was downwardly positioned in an embedding system (Embedding Center, MICROM, Germany). After a small amount of paraffin was added to the base mold, the base mold was slightly covered with a cassette and placed on a cold plate to solidify the paraffin. After the paraffin was completely solidified, the cassette was separated from the base mold to give an embedding block.

Thereafter, the completed embedding block was cut into a thin section ranging from 4 to 8 μm using a tissue microtome. Each of the thin sections was attached onto a glass slide, subjected to a desired test, and then microscopically observed.

Industrial Applicability

As described hereinbefore, the auxiliary tool of the present invention is capable of preventing contamination and loss of biopsy specimens, and simply and accurately processing a solid or viscous sample to prepare a histological or cytological preparation. Therefore, the auxiliary tool has an effect of improving efficiency of histological or cytological examination of biopsy specimens.

What is claimed is:

1. An auxiliary tool for examination of a biopsy specimen, comprising a plate and a cover, each of which is in a gel form to allow for flowing in and out of a solvent,

wherein the plate is equipped with at least one depression provided on a surface thereof as a space into which a biopsy specimen is introduced; and

the cover is equipped with at least one projection provided on a surface thereof for covering the depression of the plate by being inserted thereinto.

2. The auxiliary tool for examination of a biopsy specimen as set forth in claim 1, wherein the plate and the cover each are made of agarose, agar or gelatin.

3. An embedding block comprising the auxiliary tool for examination of a biopsy specimen according to claim 1 or 2.

4. A method of preparing a histological or cytological preparation for a biopsy specimen, comprising:

(a) introducing the biopsy specimen into the plate of the auxiliary tool for examination of the biopsy specimen according to claim 1 or 2;

(b) placing the cover of the auxiliary tool for examination of the biopsy specimen according to claim 1 or 2 onto an upper portion of the plate into which the biopsy specimen has been introduced at step (a);

(c) adding a wax to an assembly of the plate into which the biopsy specimen has been introduced and the cover, which has been obtained at step (b), and covering the assembly with a cassette to provide an embedding block; and

(d) sectioning the embedding block obtained at step (c) using a tissue microtome to provide a section containing the biopsy specimen.

FIG. 1

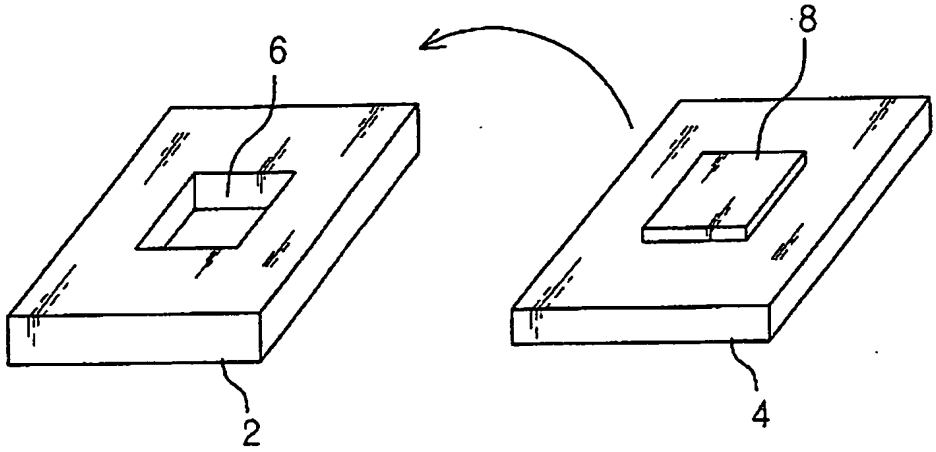


FIG. 2

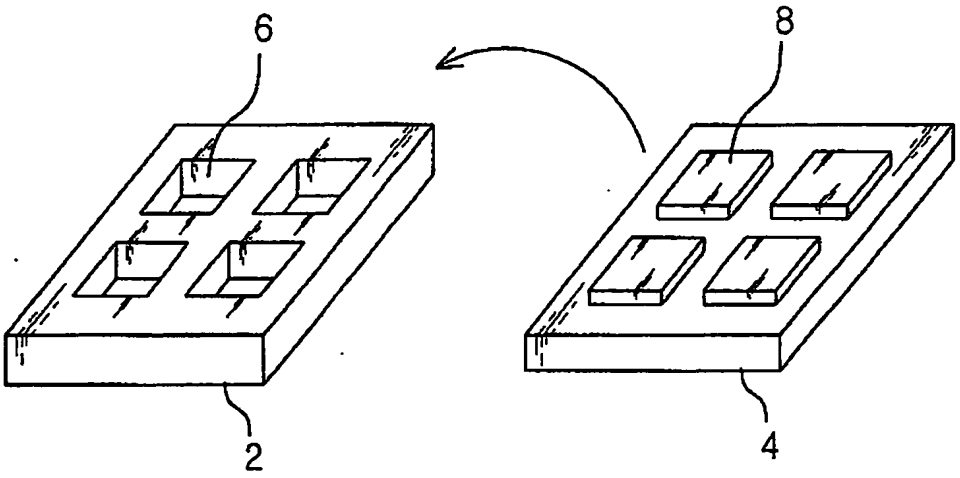


FIG. 3

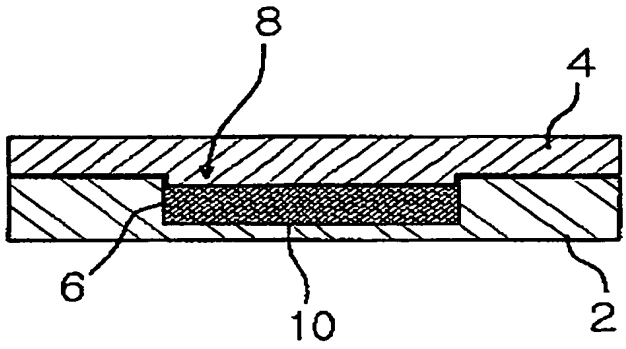
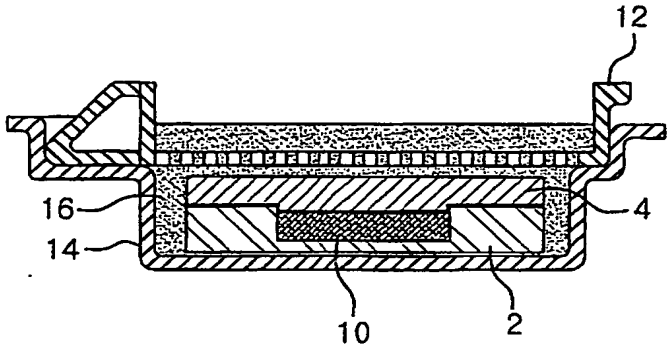
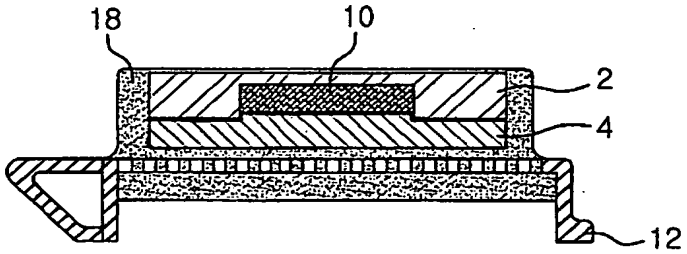


FIG. 4





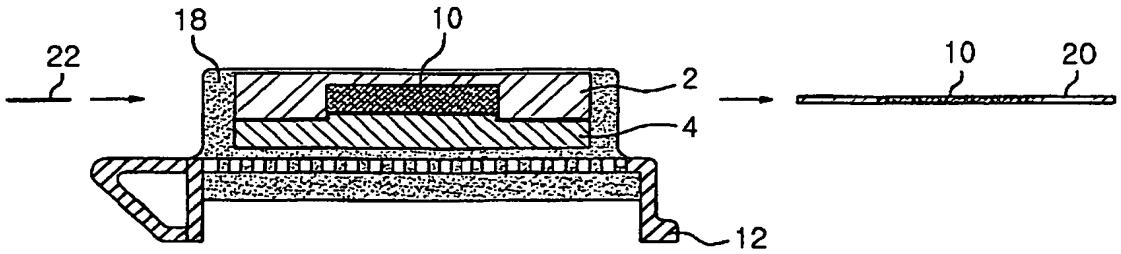
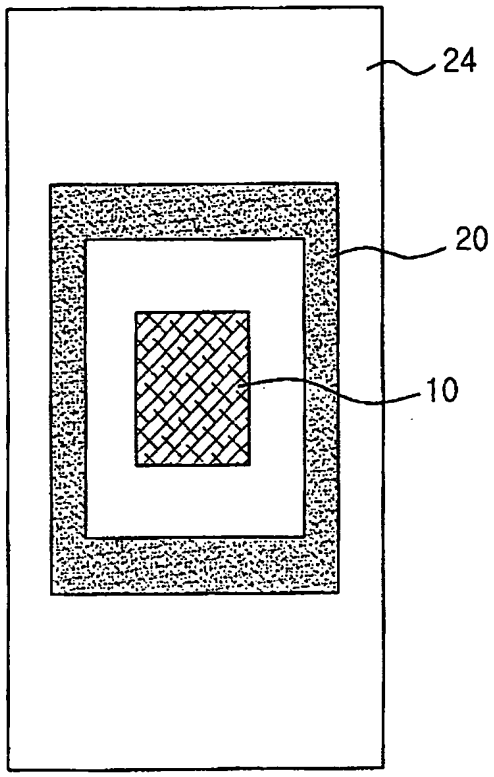


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2004/001397

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G01N 33/48, G01N 33/574, G01N 33/53, C12Q 1/68

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 G01N 33/48, G01N 33/53, G01N 1/30, G01N 1/36, G01N 1/04, B29C 45/15

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and Applications for Inventions since 1975
Korean Utility Models and Applications for Utility Models since 1975
Japanese Utility Models and Applications for Utility Models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS, WPI, USPTO, PAJ, CAPLUS(STN), INSPECT "embed, tissue sample, biological, examination, impregnation, section, G01N, preparation, gel, tissue, cassette, fix, etc."

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 08211047 A (Takezaki, T., JP) 20 Aug 1996 - see abstract, claims & figures	1-4
A	JP 10239222 A (Takezaki, T., JP) 11 Sep 1998 - see abstract, claims & figures (no patent family)	1-4
A	JP 2002303568 A (Takezaki, T., JP) 18 Oct 2002 - see abstract, claims & figures, cited in the application (no patent family)	1-4
A	US 5610022 A (City of Hope, USA) 11 Mar 1997 - see the whole document (no patent family)	1-4
A	US 6207408 A (University of Miami, USA) 27 Mar 2001 - see claims, columns 3-5 & Fig 11 (no patent family)	1-4

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
24 JANUARY 2005 (24.01.2005)	24 JANUARY 2005 (24.01.2005)

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea	SHIN, Won Hye
Facsimile No. [illegible]	Telephone No. [illegible]

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/KR2004/001397

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 08211047 A2	20 Aug 1996	AU 4547996 A1	21 Aug 1996
		CN 1172529 A	04 Feb 1998
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